Bronx-Whitestone Bridge

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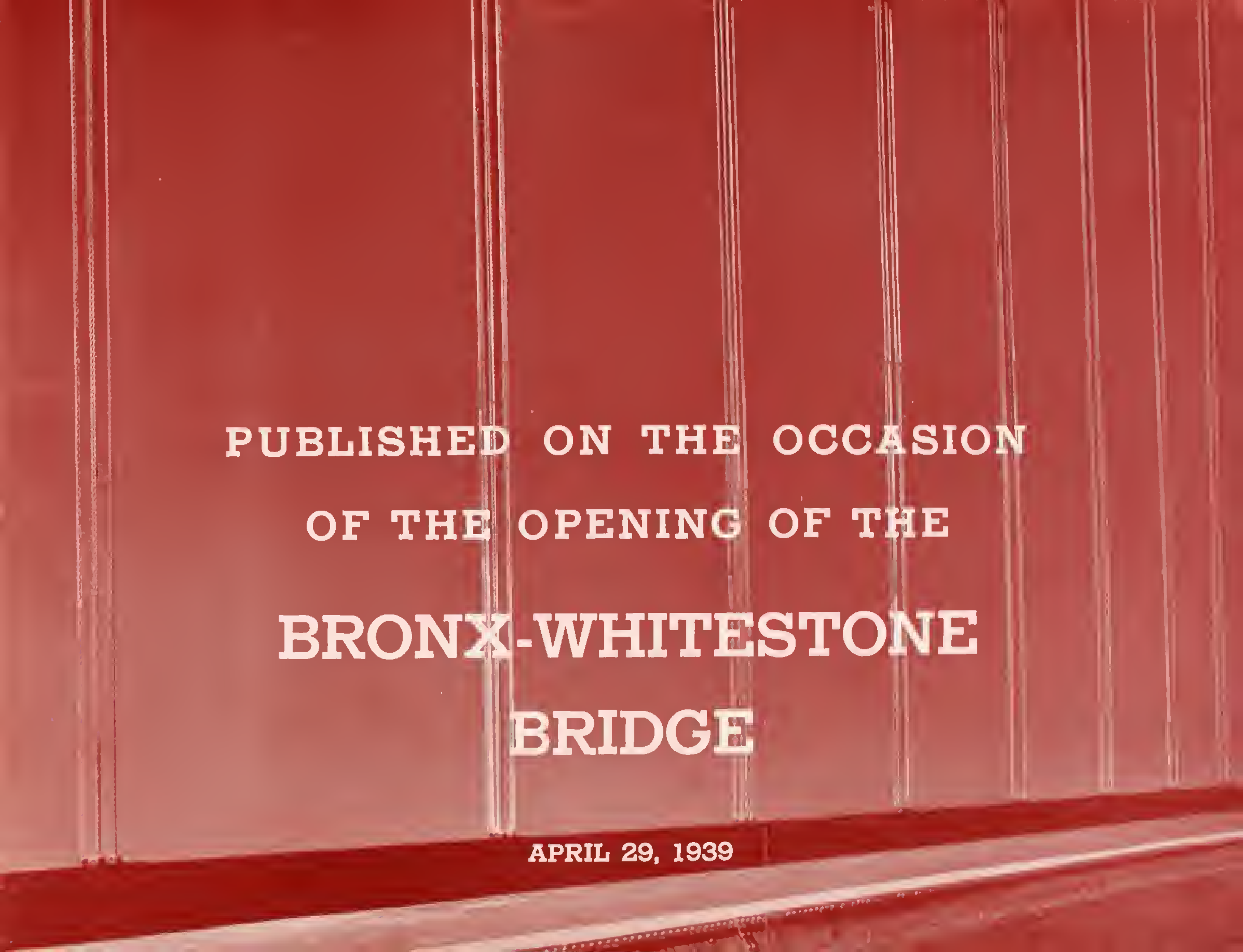


PUBLISHED ON THE OCCASION
OF THE OPENING OF THE

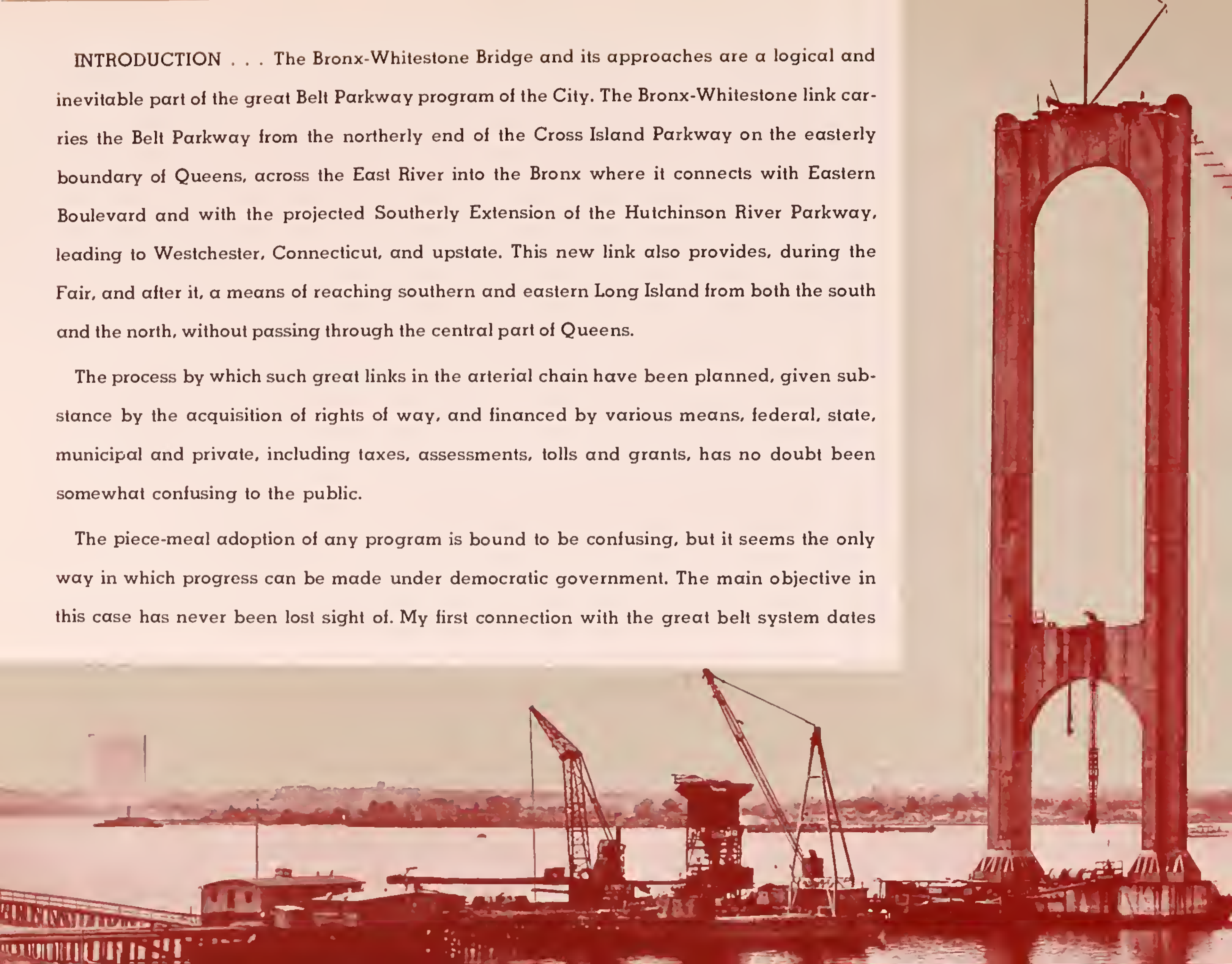
BRONX-WHITESTONE BRIDGE

APRIL 29, 1939

INTRODUCTION . . . The Bronx-Whitestone Bridge and its approaches are a logical and inevitable part of the great Belt Parkway program of the City. The Bronx-Whitestone link carries the Belt Parkway from the northerly end of the Cross Island Parkway on the easterly boundary of Queens, across the East River into the Bronx where it connects with Eastern Boulevard and with the projected Southerly Extension of the Hutchinson River Parkway, leading to Westchester, Connecticut, and upstate. This new link also provides, during the Fair, and after it, a means of reaching southern and eastern Long Island from both the south and the north, without passing through the central part of Queens.

The process by which such great links in the arterial chain have been planned, given substance by the acquisition of rights of way, and financed by various means, federal, state, municipal and private, including taxes, assessments, tolls and grants, has no doubt been somewhat confusing to the public.

The piece-meal adoption of any program is bound to be confusing, but it seems the only way in which progress can be made under democratic government. The main objective in this case has never been lost sight of. My first connection with the great belt system dates



back to 1928, and in 1930 I was the Chairman of the Metropolitan Conference on Parks, which printed a pamphlet definitely outlining and mapping this project. Since then, as a state, and later as a city official, in various capacities I have labored with the loyal and enthusiastic assistance of several groups of executives and engineers, not to speak of other public officials, to fulfill this purpose. Bit by bit it has been accomplished. The West Side Improvement and Henry Hudson Parkway were part of it. The Triborough Bridge and its approaches constitute another link. The East River and Harlem Drives which are being built in sections, are also part of the story. The Belt Parkway in Brooklyn and Queens, will be open on July 1st, 1940. The Marine Parkway, Jacob Riis Park, Rockaway Improvement, and reconstruction of the Cross Bay Boulevard to be completed on June 4th of this year, are additional links. The southerly extension of the Westchester parkways through the Bronx to connections with the Triborough and Bronx-Whitestone Bridges, are essential features of this program. The Grand Central Parkway and Interborough Parkway are factors.

All of these parkway links include many park, playground, and recreational facilities along their borders for the benefit of local residents who are not primarily interested in driving cars. The Belt System will open to development, largely residential and recreational,

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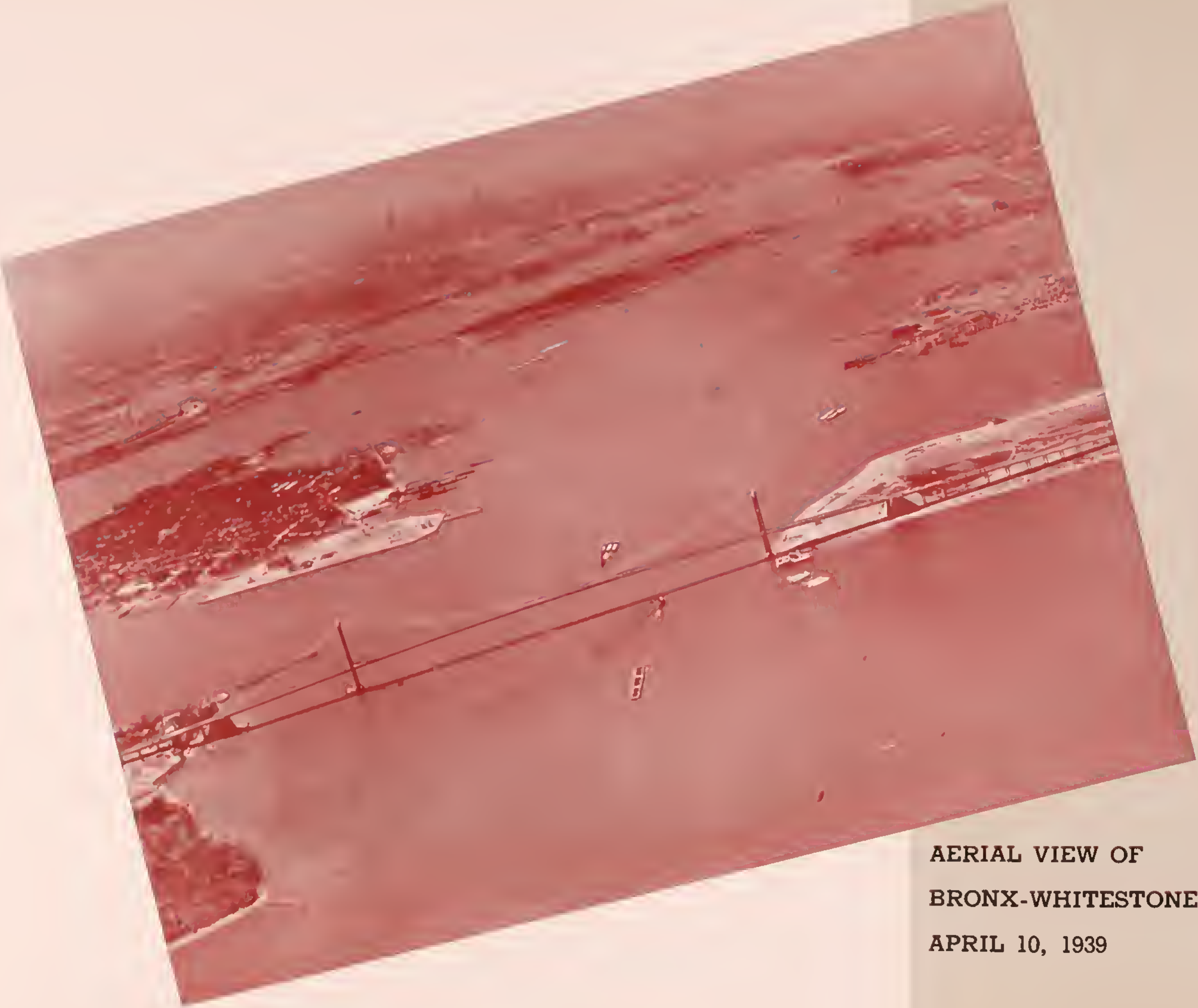


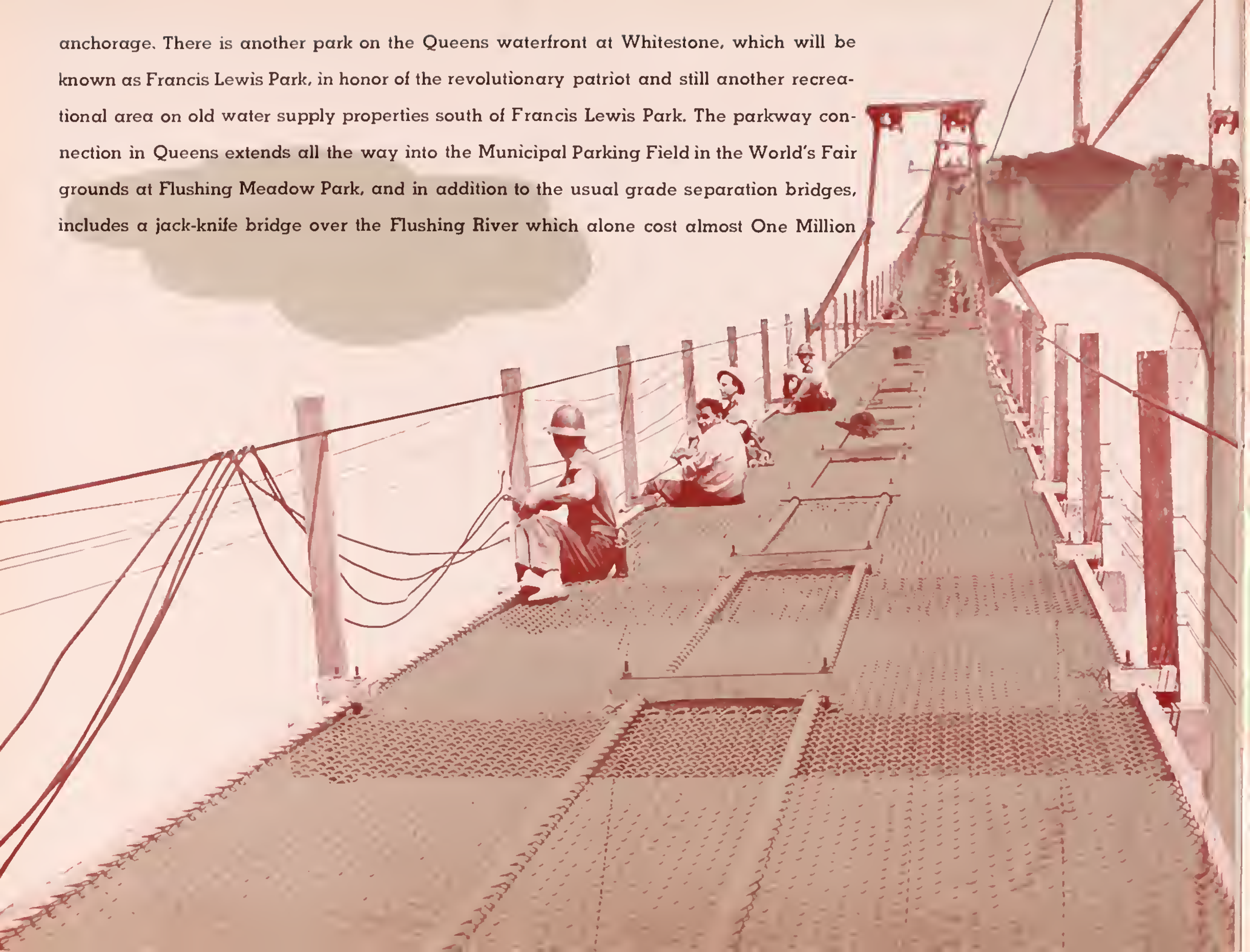
AERIAL VIEW OF

BRONX-WHITESTONE BRIDGE

APRIL 10, 1939

areas of the city hitherto inaccessible or neglected. It will reclaim idle and useless land. It will restore sections which have become dumps and eyesores. It will set a standard of convenience and beauty for private and other public enterprises. It will knit the five boroughs of the city closer together. In some cases, it will combine with bridge and other facilities to provide for commercial and industrial revival as well as residential and recreational. It will raise property values and will pay for itself in the form of increased assessments. This system is not a luxury. It is a necessity, without which New York would go backwards steadily in competition with other communities which have greater conveniences, even though they are less fortunately situated.

The Bronx-Whitestone Bridge is part of the Triborough Bridge Authority. The Triborough Bridge was so successful that it was possible to refinance it, purchase the outstanding bonds from the Reconstruction Finance Corporation at a profit to that corporation of $1,400,000, and sell a larger bond issue including$18,000,000 for the Bronx-Whitestone Bridge to the general public through ordinary private banking channels on reasonable terms. The Bronx-Whitestone project begins at Eastern Boulevard with a parkway connection leading to the bridge at Old Ferry Point, which has been acquired and converted into a large public park to be known in future as Ferry Point Park. The bridge is 4,000 feet long from anchorage to anchorage. There is another park on the Queens waterfront at Whitestone, which will be known as Francis Lewis Park, in honor of the revolutionary patriot and still another recreational area on old water supply properties south of Francis Lewis Park. The parkway connection in Queens extends all the way into the Municipal Parking Field in the World's Fair grounds at Flushing Meadow Park, and in addition to the usual grade separation bridges, includes a jack-knife bridge over the Flushing River which alone cost almost One Million



and a Half Dollars. The entire project has been landscaped, and service roads have been provided for future marginal growth and development. The main suspension bridge itself is not only the fourth longest in the world in length, ranking just after the George Washington Bridge, and the two San Francisco bridges, but is I believe, architecturally the finest of them all. I know of nothing comparable to it, in cleanness and simplicity of design, in lightness, and in the absence of pretentiousness and ornamentation. If there is such a thing, as pure functional architecture, we have it here.

It is difficult to single out in a brief statement of this kind, the men responsible for this structure. They include not only the executives and staff of the Triborough Bridge Authority, and their consultants and advisors, the Park Department, Borough Presidents, and other City Officials, from Mayor La Guardia down the line, but also the bankers who provided the finances, the contractors, and the workers on the scene and back of it in the mines, fabricating plants, and transportation companies, and finally the Works Progress Administration which has helped landscape the park areas. I doubt whether in the history of such projects in these parts, there has been another which has proceeded so smoothly and quickly, and with so little friction and argument. No better evidence of this can be cited, than the fact that the new bridge opens two months ahead of the original schedule, and a month ahead of the revised fast schedule made a year ago. It will be ready for the opening of the World's Fair tomorrow, and I am sure that millions of visitors will enjoy this new gateway, and remember it as one of the great attractions of New York.

ROBERT MOSES

TRIBOROUGH BRIDGE AUTHORITY

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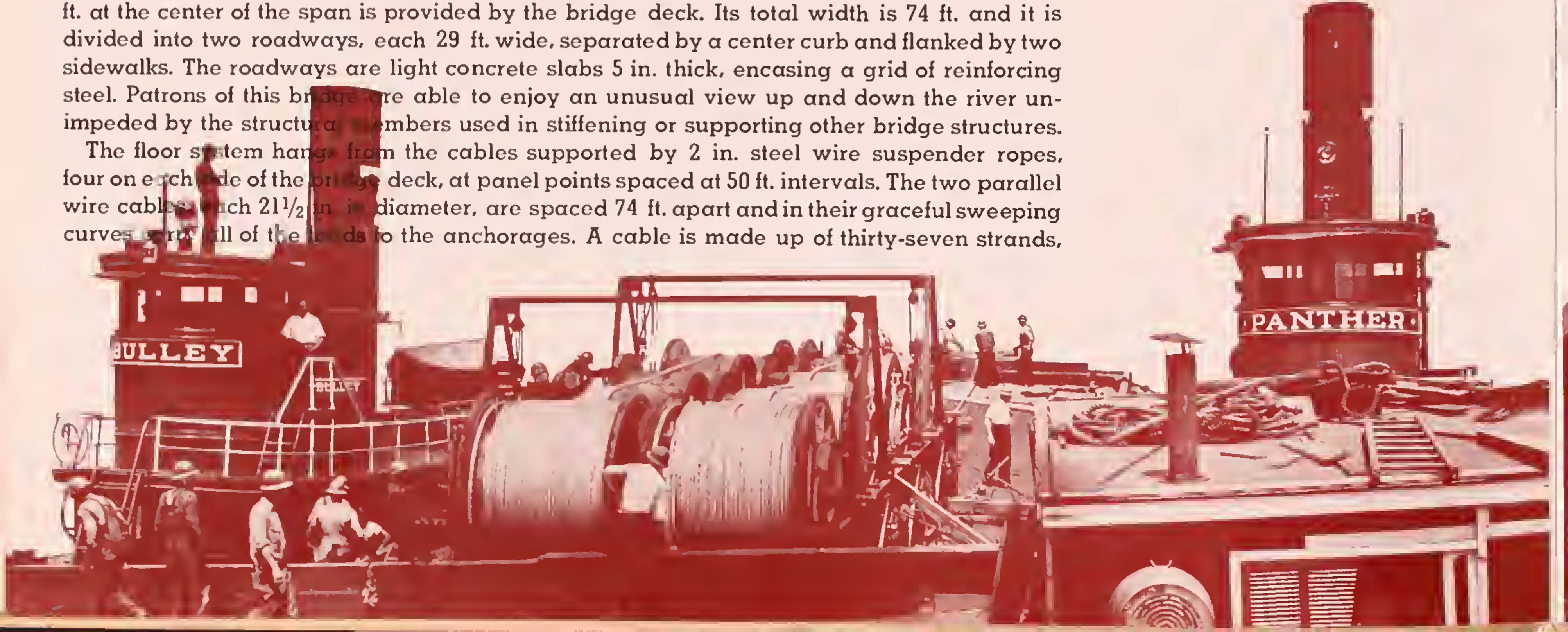
DESIGN AND CONSTRUCTION of the Bronx-Whitestone Bridge with its main span of 2,300 ft. is the fourth longest suspension bridge yet built and, by advancing the development of a number of new features which it embodies, it has made an important contribution to the art of building great bridges. Two features are of striking importance, namely, the flexible stiffening system in the form of solid plate girders and the rigid frame type of towers, devoid of diagonal bracing either above or below the floor. These characteristics are further exemplified in the design of the anchorages and adjacent approach viaducts. The sum total is a structure of unusually graceful and pleasing appearance.

This simplicity of design in no small degree contributed to the unprecedented speed of its construction. From the award of the first construction contract for the tower piers and anchorage foundations, in June, 1937 to the opening of the bridge in April, 1939, only twenty-three months have elapsed, an unheard of time for completing such an important enterprise.

At the bridge site the East River narrows to a width of about 3,300 ft. between shore lines and to 2,250 ft. between pierhead lines. The tower piers were located shoreward of the latter, thus determining the length of clear center span. Side spans were made 735 ft. The total length of the bridge proper, including anchorages, is 3,840 ft. while the length of bridge structure, including approaches from the end of the ramp in the Bronx to the end of the ramp in Queens, is 7,140 ft.

A clear height of 135 ft. above high water at the channel line near the Bronx shore and 150 ft. at the center of the span is provided by the bridge deck. Its total width is 74 ft. and it is divided into two roadways, each 29 ft. wide, separated by a center curb and flanked by two sidewalks. The roadways are light concrete slabs 5 in. thick, encasing a grid of reinforcing steel. Patrons of this bridge are able to enjoy an unusual view up and down the river unimpeded by the structural members used in stiffening or supporting other bridge structures.

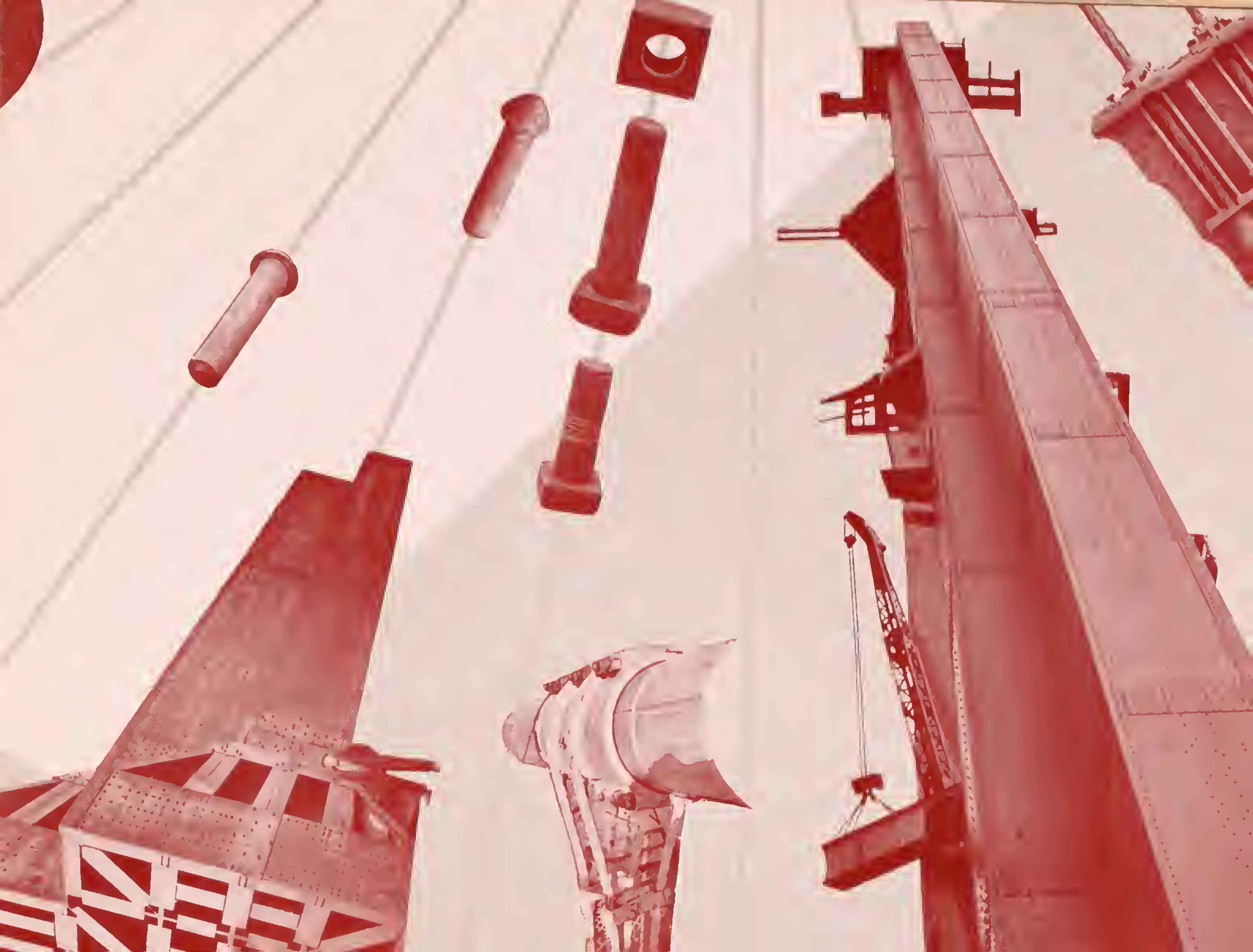
The floor system hangs from the cables supported by 2 in. steel wire suspender ropes, four on each side of the bridge deck, at panel points spaced at 50 ft. intervals. The two parallel wire cables, each 21½ in. in diameter, are spaced 74 ft. apart and in their graceful sweeping curves carry all of the loads to the anchorages. A cable is made up of thirty-seven strands,



each of which is in itself a separate cable or bundle of 266 parallel steel wires, and each strand is separately spun and is individually attached to chains of embedded eyebars at the anchorages. In the completed cable these strands and wires are compressed into the circular shape, wrapped with wire and clamped at intervals with cable bands. The wire used in these cables is cold drawn to about one-fifth inch diameter, is about four times as strong as ordinary structural steel (averaging 233,300 lbs. per sq. in. of steel area) and is galvanized to resist rust. About 14,800 miles of wire, weighing a total of approximately 4,370 tons, were required for these cables. Together, under maximum conditions, they may exert a pull at each anchorage amounting to approximately 50,000,000 lbs.

The towers are 377 ft. high and each required 3,500 tons of structural steel for its construction. They are designed to be flexible and are of simple construction. Two vertical shafts are tied together by two deep portals, one at the top high above the floor, and one immediately below the floor. Each shaft is "T" shape in section and is subdivided by interior steel walls or webs into twelve rectangular cells. The cables are in fixed position in the saddle castings at their tops with the result that the towers may bend shoreward or riverward as loads and temperatures on the bridge may require, as much as 15 in. from the vertical position. Secure attachment of the tower base to the pier is made by means of twenty-four 3 in. anchor bolts which engage a steel frame embedded in the concrete. The tower rests on a pier consisting of two solid concrete pedestals 34 ft. square and 24 ft. deep, connected by a deep reinforced concrete strut in the shape of an inverted "U". Each pedestal rests on a hollow concrete shaft 38 ft. square which goes down to solid rock where its bottom is sealed with concrete. Rock at the Bronx tower pier is at a depth of about 98 ft. and on the Queens side at a depth of 150 ft. Because of these extreme depths it was impossible to use pneumatic caissons and accordingly the pier foundations were put down as open-dredged concrete caissons. 15,000 cu. yds. of concrete were required for the Queens tower pier and somewhat less for the Bronx pier.

The anchorages, constructed of mass concrete, are 110 ft. wide, 180 ft. long and 110 ft. high and are almost triangular in elevation, the rear face being curved to follow the general direction of the cables and anchorage chains. The eyebar chains are embedded in the concrete



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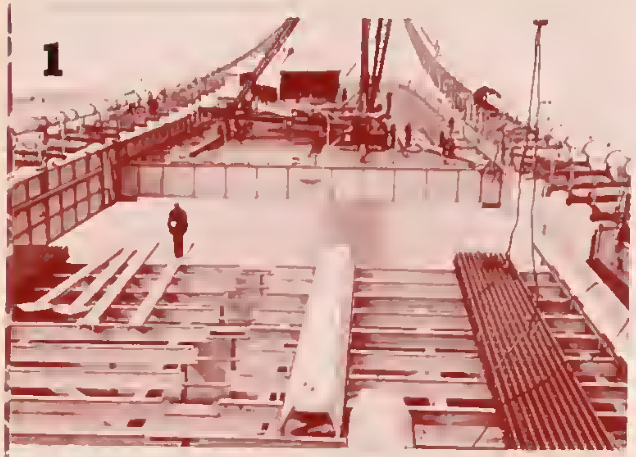

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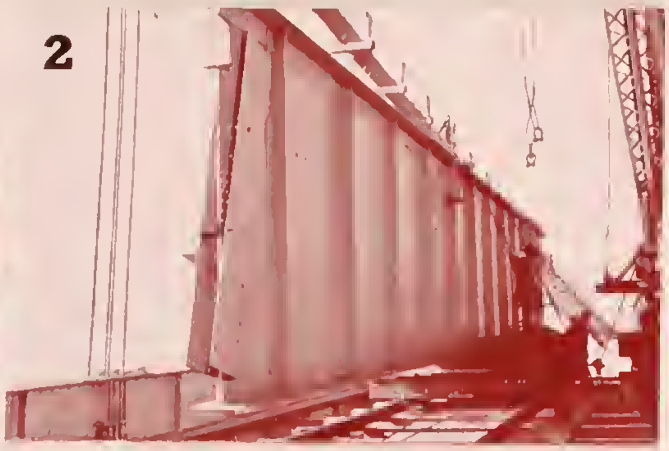

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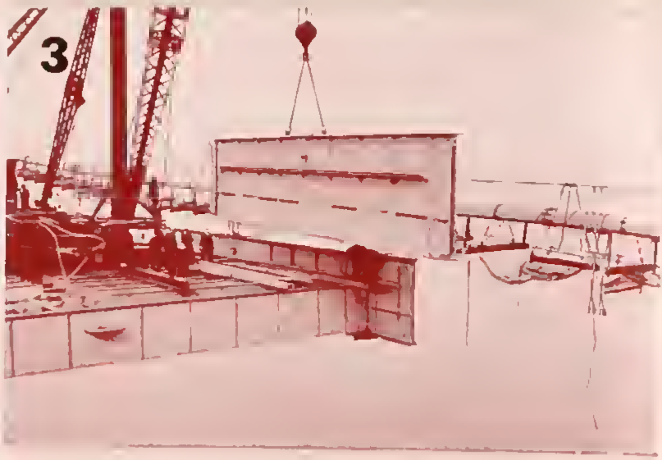

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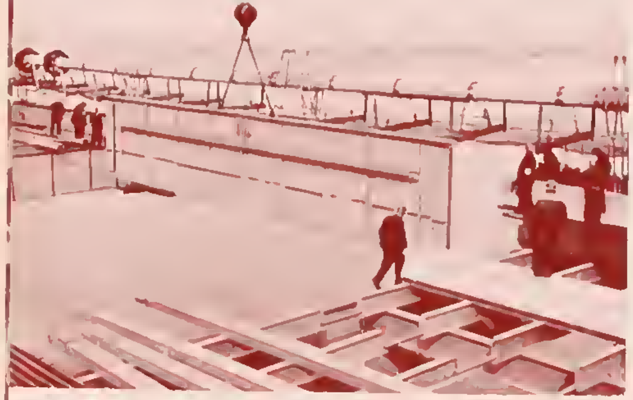

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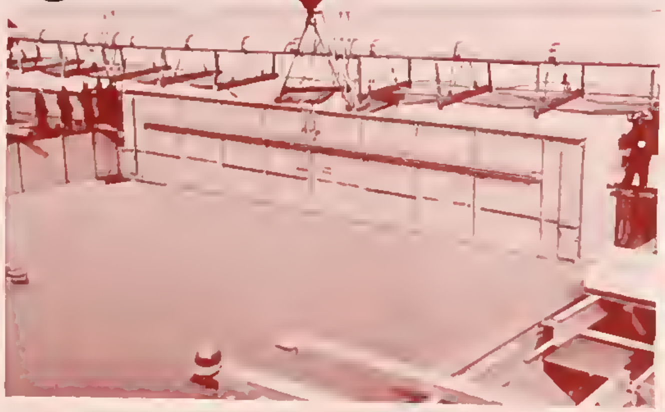

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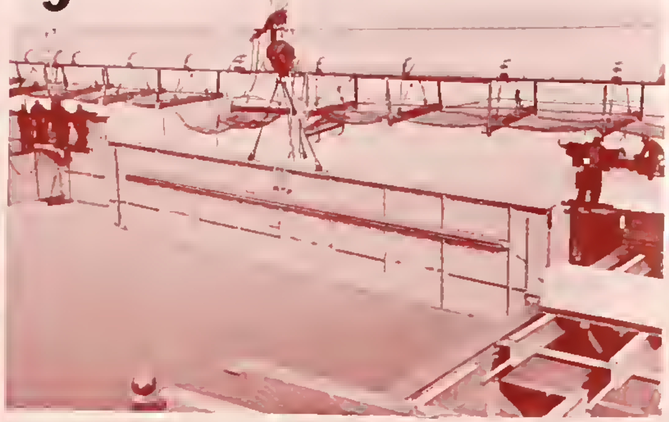

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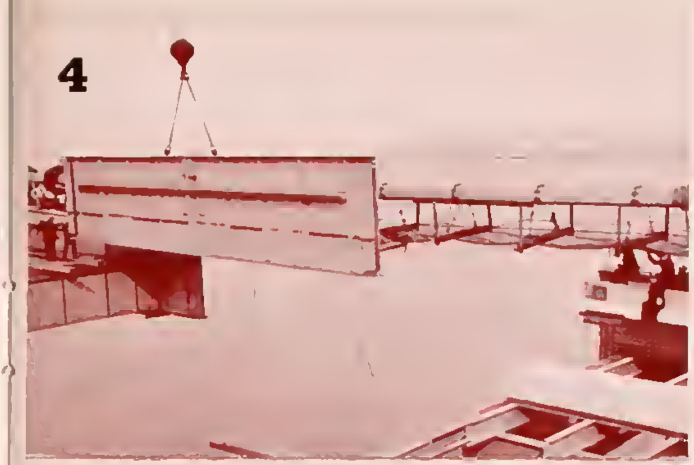

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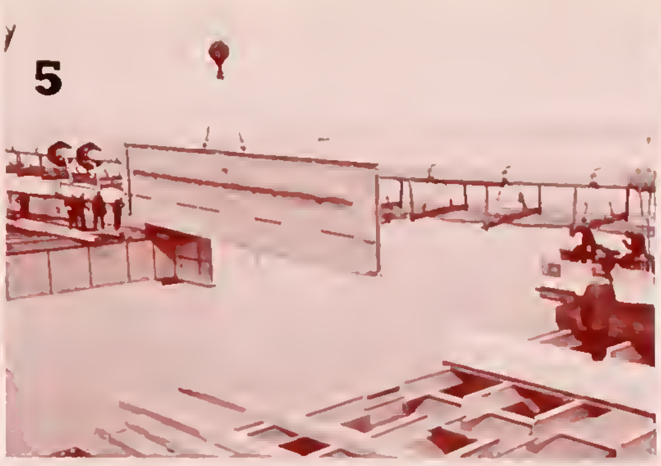

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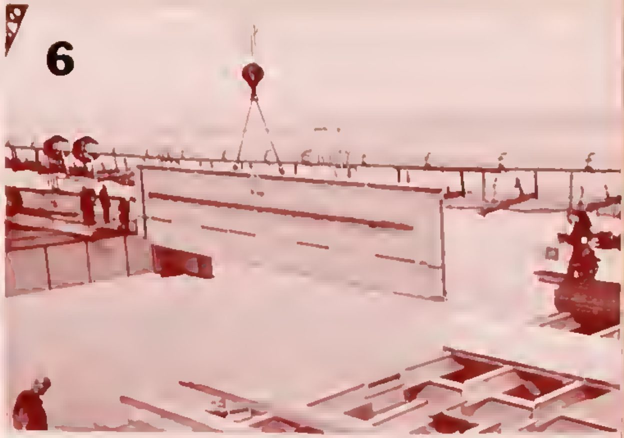

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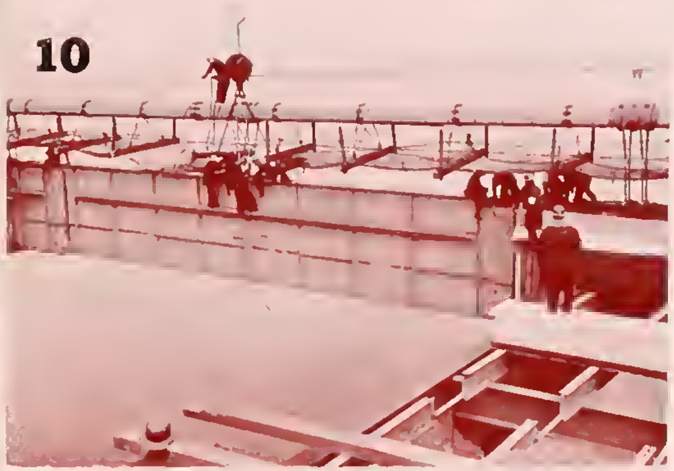

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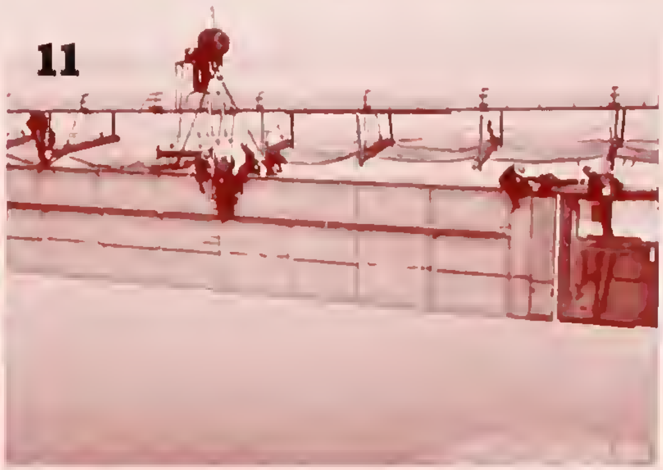

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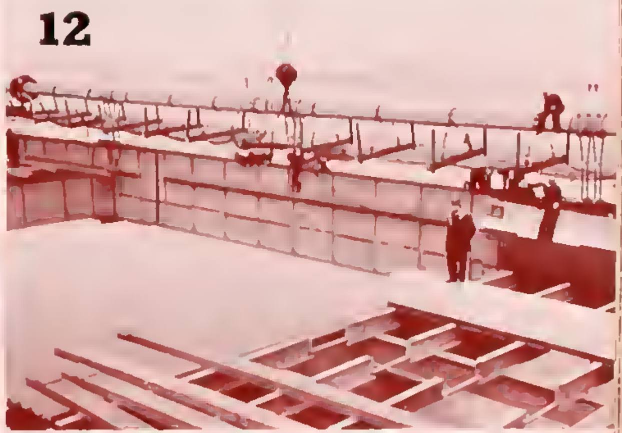

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PICTURES

LAST EXTERIOR GIRDER

February 14th, 1939

and attach to anchor girders near the heel of the anchorage block. The Bronx anchorage has a concrete base 15 ft. thick which distributes the pressure to the firm sand and gravel soil only 16 ft. to 21 ft. below the surface. The Queens anchorage, however, rests on four caissons, two of which are rectangular and are under the front part. Two circular caissons are at the rear. All four are carried to solid rock at depths which are a record for this vicinity,—from 156 ft. to 164 ft. below mean high water. All were sunk by excavating from the surface in open dredging wells. The portion of each anchorage above ground surface contains about 34,000 cu. yds. of concrete while the deep foundations for the Queens anchorage add another 15,000 cu. yds. The total quantity of concrete in foundations, piers and anchorages of the bridge approximates 200,000 cu. yds.

Sinking of the tower pier caissons and preparation of the pedestals to receive the towers required about five months time. The actual tower erection, however, proceeded with record speed, only eighteen working days erection time being required for each tower. This is accounted for by the unusual simplicity of the design and to the excellent shop fabrication, all sections having been milled and assembled with adjacent sections in the shops in advance, according to the customary procedure. Lower sections were hoisted into place by derrick boat and higher sections by erection traveler which mounted upward on the column steel previously placed. Approximately 50,000 1 in. field rivets were driven in each tower.

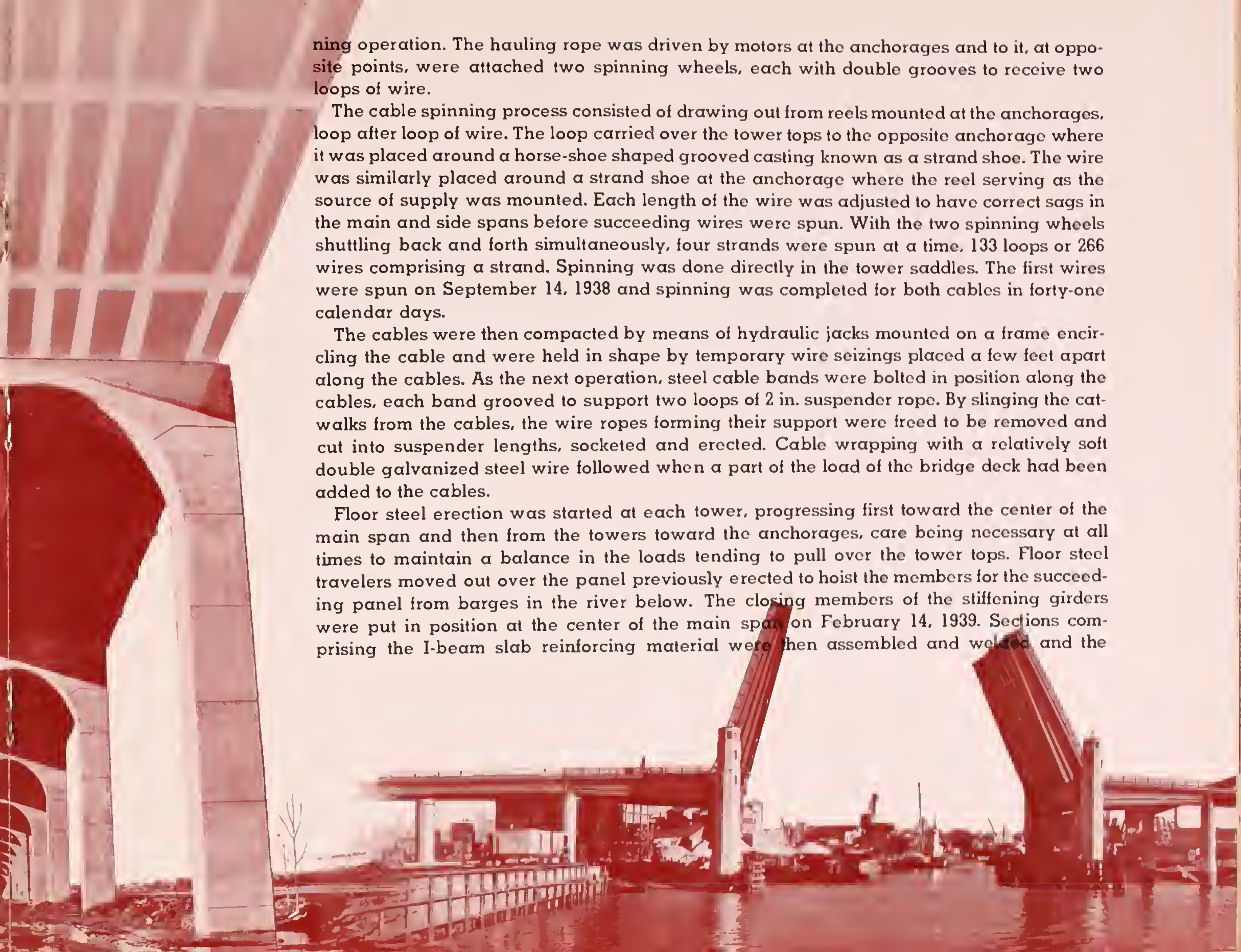
Probably the most colorful and interesting operation in bridge construction is the process of cable spinning. The first step was the erection of the falsework or so-called "catwalks" for the use of the workmen. A catwalk was located beneath each cable, the open mesh wire grid and timber floor beams comprising it being supported on four 2 in. wire ropes. These ropes for the main span, mounted on large reels, were laid out on the river bottom while towed across the river on barges, and were then hoisted to points of attachment at the tower tops. The first ropes were hoisted into position on July 14, 1938. Each was 2,400 ft. long and weighed 18,000 lbs. Handropes with wooden posts, signal and telephone wires were next put in position. Finally, falsework bents were set up at intervals along the walks, in main and side spans and at the tower tops and anchorages to support the endless hauling rope used in the spin-

ning operation. The hauling rope was driven by motors at the anchorages and to it, at opposite points, were attached two spinning wheels, each with double grooves to receive two loops of wire.

The cable spinning process consisted of drawing out from reels mounted at the anchorages, loop after loop of wire. The loop carried over the tower tops to the opposite anchorage where it was placed around a horse-shoe shaped grooved casting known as a strand shoe. The wire was similarly placed around a strand shoe at the anchorage where the reel serving as the source of supply was mounted. Each length of the wire was adjusted to have correct sags in the main and side spans before succeeding wires were spun. With the two spinning wheels shuttling back and forth simultaneously, four strands were spun at a time, 133 loops or 266 wires comprising a strand. Spinning was done directly in the tower saddles. The first wires were spun on September 14, 1938 and spinning was completed for both cables in forty-one calendar days.

The cables were then compacted by means of hydraulic jacks mounted on a frame encircling the cable and were held in shape by temporary wire seizings placed a few feet apart along the cables. As the next operation, steel cable bands were bolted in position along the cables, each band grooved to support two loops of 2 in. suspender rope. By slinging the catwalks from the cables, the wire ropes forming their support were freed to be removed and cut into suspender lengths, socketed and erected. Cable wrapping with a relatively soft double galvanized steel wire followed when a part of the load of the bridge deck had been added to the cables.

Floor steel erection was started at each tower, progressing first toward the center of the main span and then from the towers toward the anchorages, care being necessary at all times to maintain a balance in the loads tending to pull over the tower tops. Floor steel travelers moved out over the panel previously erected to hoist the members for the succeeding panel from barges in the river below. The closing members of the stiffening girders were put in position at the center of the main span on February 14, 1939. Sections comprising the I-beam slab reinforcing material were then assembled and welded and the



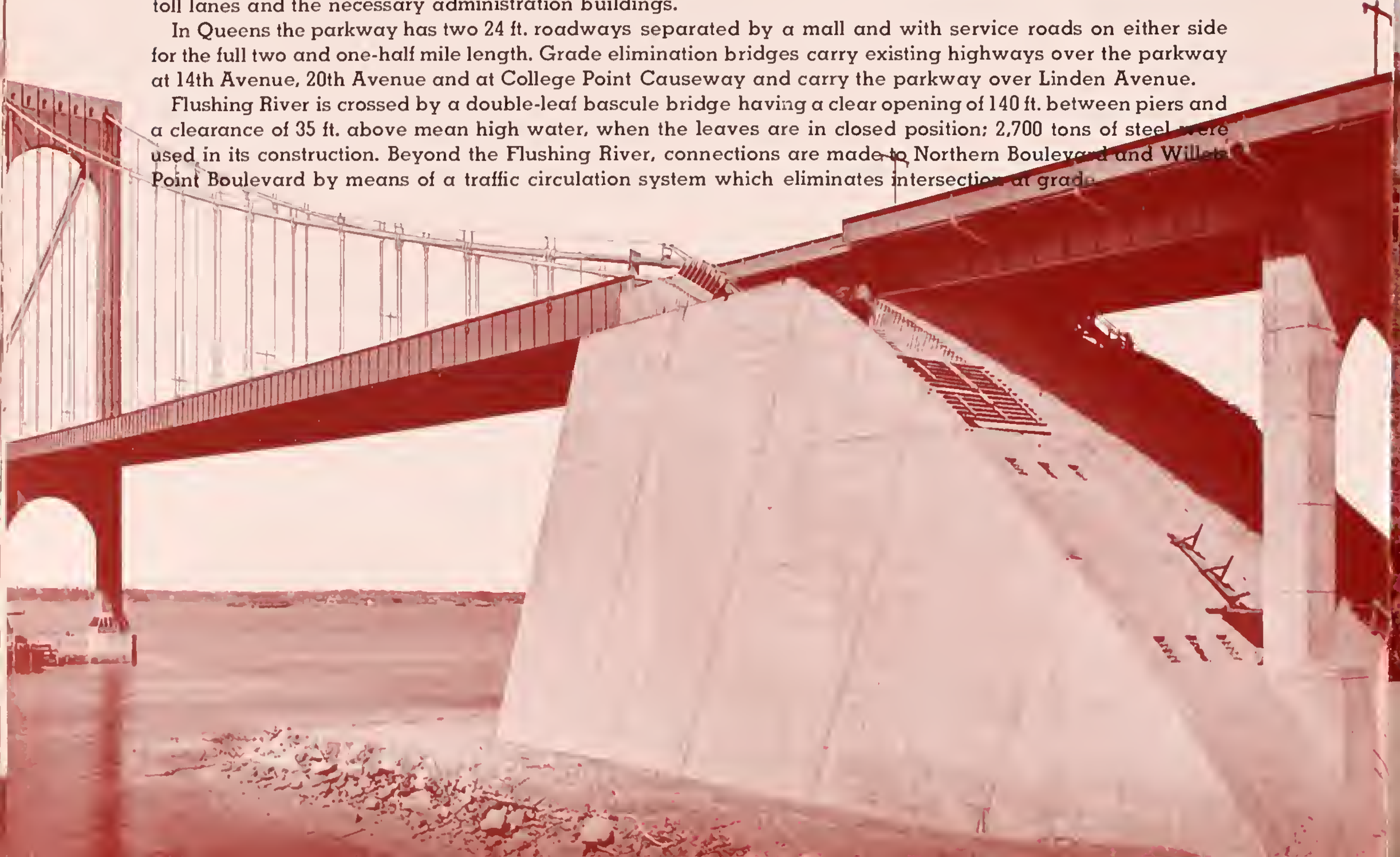
concrete of the slab was placed, the latter covering the steel to a depth of three-fourths in. to provide a uniform wearing surface. Roadway expansion joints are located at each tower.

The steelwork, exclusive of reinforcing steel in the bridge and approaches, totals 22,300 tons, including 14,500 tons of carbon steel, 3,030 tons of silicon steel in the main span stiffening girders, 400 tons of cast steel and 4,370 tons of steel wire. The I-beam reinforcing steel for the roadway slab of the suspended structure totals 1,565 tons.

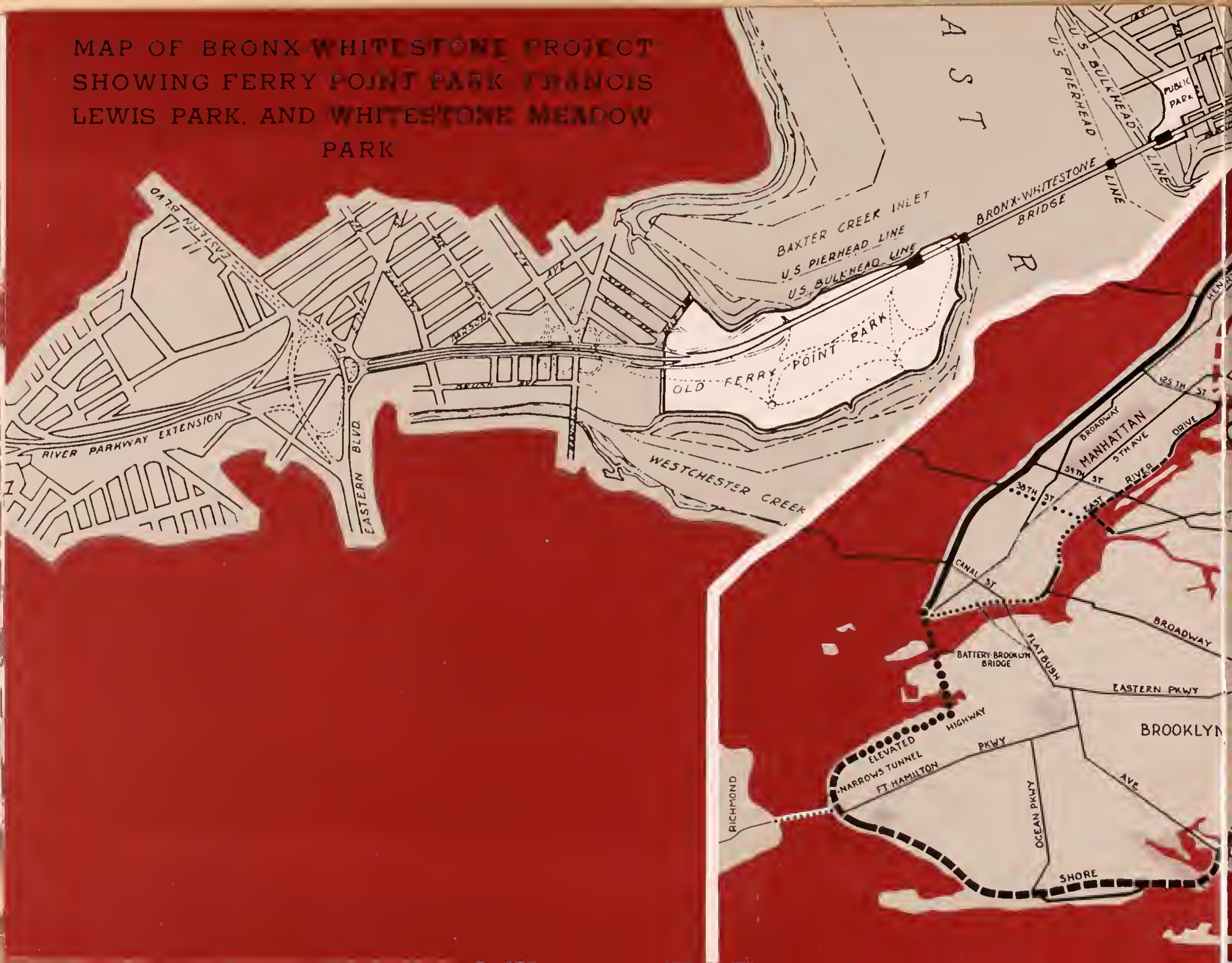
Tolls are collected in a plaza at the foot of the Bronx approach ramp. Facilities at that location include ten toll lanes and the necessary administration buildings.

In Queens the parkway has two 24 ft. roadways separated by a mall and with service roads on either side for the full two and one-half mile length. Grade elimination bridges carry existing highways over the parkway at 14th Avenue, 20th Avenue and at College Point Causeway and carry the parkway over Linden Avenue.

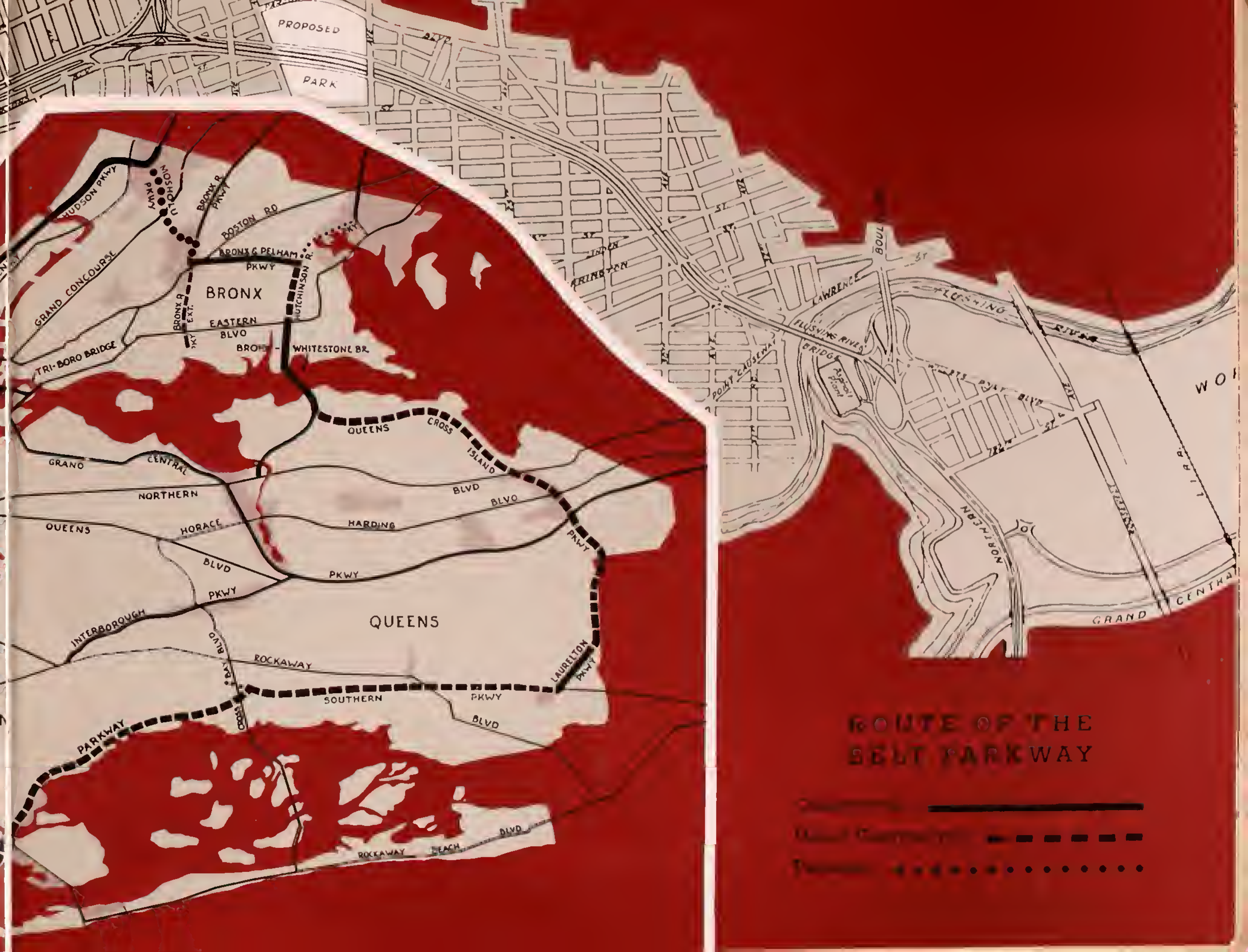
Flushing River is crossed by a double-leaf bascule bridge having a clear opening of 140 ft. between piers and a clearance of 35 ft. above mean high water, when the leaves are in closed position; 2,700 tons of steel were used in its construction. Beyond the Flushing River, connections are made to Northern Boulevard and Willets Point Boulevard by means of a traffic circulation system which eliminates intersection at grade.



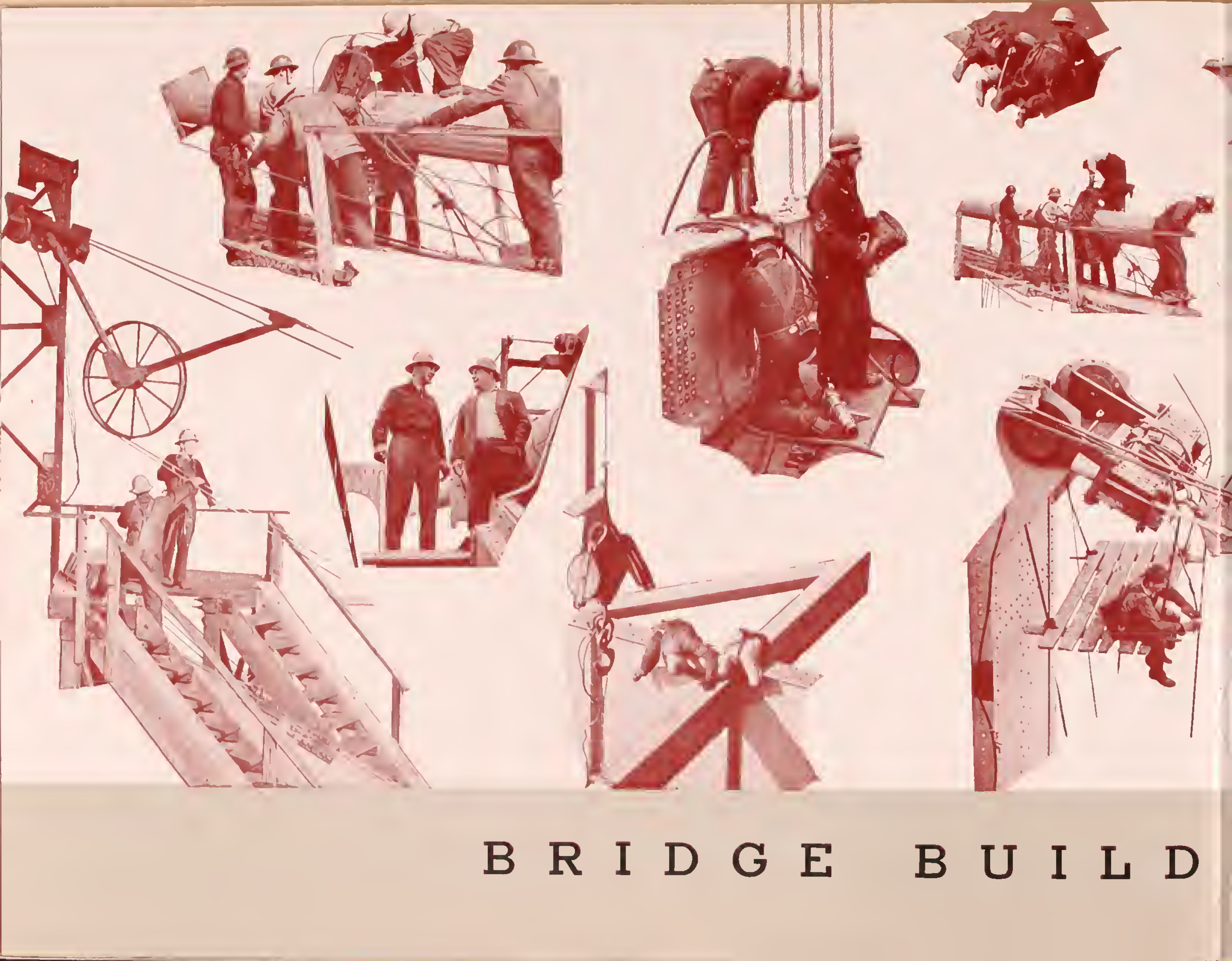
QUEENS APPROACH THROUGH MALBA



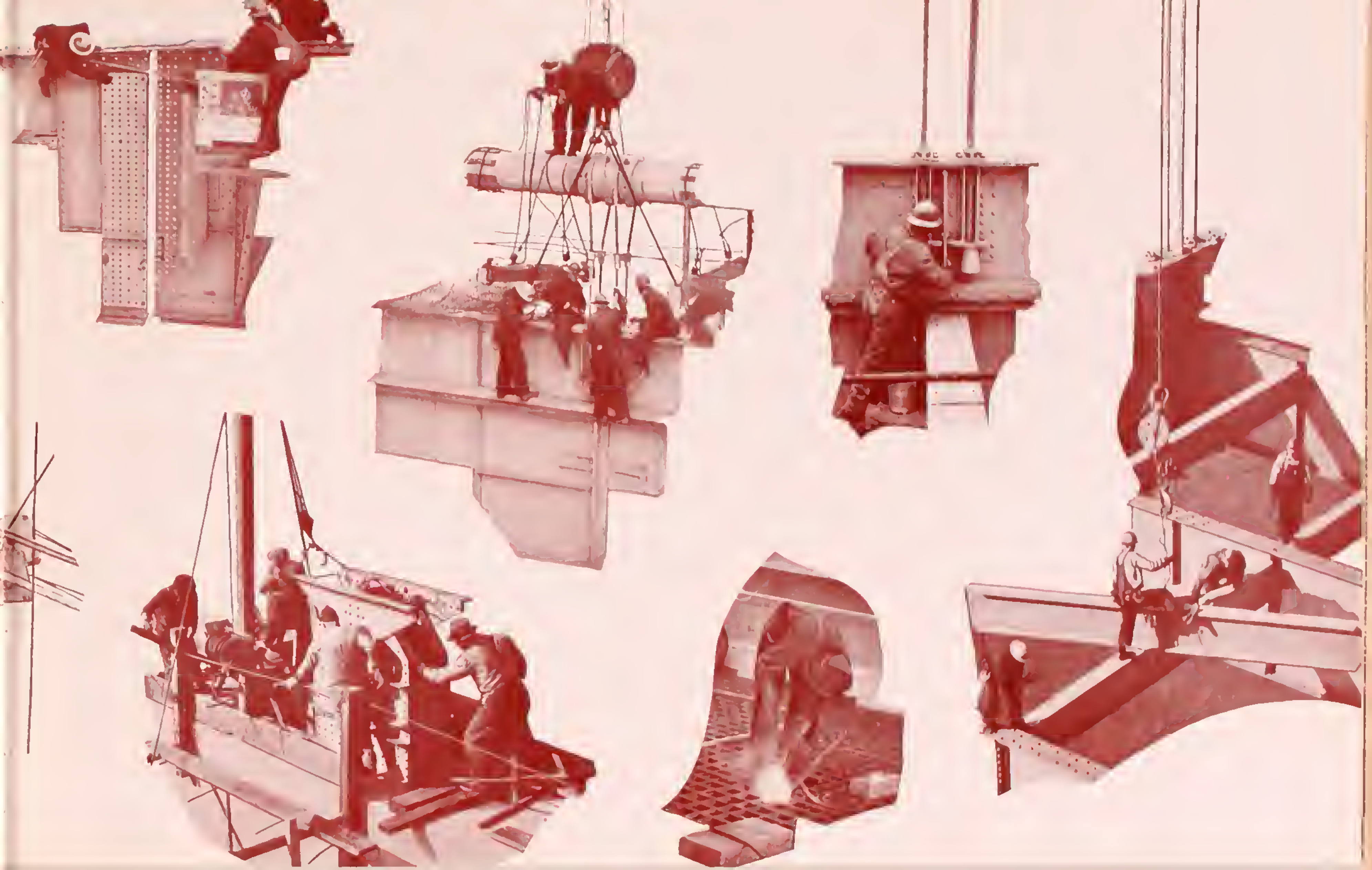
MAP OF BRONX-WHITESTONE PROJECT SHOWING FERRY POINT PARK, FRANCIS LEWIS PARK, AND WHITESTONE MEADOW PARK



ROUTE OF THE
BELT PARKWAY



BRIDGE BUILD



ERS AT WORK

THE BELT PARKWAY is, as its name implies, a roadway encompassing the borders of Brooklyn and Queens from the Bronx-Whitestone Bridge to Owl's Head Park on Lower New York Bay. The parkway itself is made up of three sections: the Cross Island Parkway leading southward across Queens; the Southern Parkway which is replacing the old Sunrise Highway; and the Shore Parkway skirting Jamaica Bay, Gravesend Bay and Lower New York Bay. The construction of this parkway has been made possible through an appropriation of $16,000,000 by the City of New York and an outright P.W.A. grant of $12,000,000.

The route of the parkway was selected in order to make easy of access the recreational facilities of Long Island, to open the development of many square miles of vacant land and to provide a means of safe, rapid communication within the city itself and between Long Island, New England and Westchester.

The Belt Parkway is to be landscaped for its full length and will bring about a complete change in the use of the adjoining lands. Protective zoning has been established which reserves the area adjacent to the parkway in the most part for residential development. The effect of the parkway on real estate values will be more noticeable in the low lying lands along Jamaica Bay. Heretofore, inadequate transportation facilities have thwarted any attempt to reclaim this land and prepare it for building sites. Even today, with high land values throughout the rest of the city, there are ten square miles of land adjacent to the parkway, less than fifteen per cent of which now contains buildings. The new parkway will bring this area within easy commuting distance of the heart of the city and will undoubtedly focus the attention of real estate operators on the advantages of residential development in the area.

In addition to its effect on land values, the parkway will open the recreational facilities of Long Island to residents of the city. Cross Island Parkway passes the municipal golf courses at Clearview and lies along the shore of Little Neck Bay, where a public boat basin is to be constructed. Farther south, it passes through Alley Pond Park, a large wooded park with picnic areas, shaded walks, and bridle paths, as well as active recreational centers, containing tennis courts, handball courts and baseball diamonds. The parkway intersects Grand Central Parkway and Southern State Parkway, which lead easterly and reach far into Long Island.

Long Island is justly known as New York's playground. Its south shore is composed of miles of sandy beach, including widely famed Jones Beach, a unique example of intelligent and far-sighted planning. Camping, boating, fishing and numerous golf courses are available to those who prefer these phases of recreation.

The whole area is made easy of access by the Northern State and Southern State Parkways which are a part of the whole system.

As the parkway passes Jamaica Bay, it intersects Cross Bay Boulevard, which leads south to the new $1,500,000 shore front park in Rockaway, and with Flatbush Avenue, which connects by means of the Marine Parkway Bridge, with Jacob Riis Park at the westerly end of the Rockaway Peninsula. As an integral part of the system, it is proposed to set aside the islands and waters of Jamaica Bay for recreational purposes. The new program calls for the complete rezoning of the bay, including the protection of scenery, the establishment of sanctuaries for wild life, and the encouragement of swimming, boating and fishing in the waters of the bay. This is the last large area in the city that has changed little in character during the past years and is capable of being transformed into a great public improvement at small expense.

An elevated express highway is being considered to extend the parkway north along New York Bay to the proposed Brooklyn-Battery Bridge and thus across the East River to the East River Drive and to the West Side Highway and Henry Hudson Parkway in Manhattan. This will complete the circumferential route around the city and will, for the first time, provide free access to the beaches of Long Island for residents of that borough. The bridge, of course, will not be limited to passenger automobiles as is the balance of the parkway, and will prove of inestimable value in the future commercial development of the Brooklyn waterfront and in the interchange of commerce between the Boroughs of Manhattan and Brooklyn.

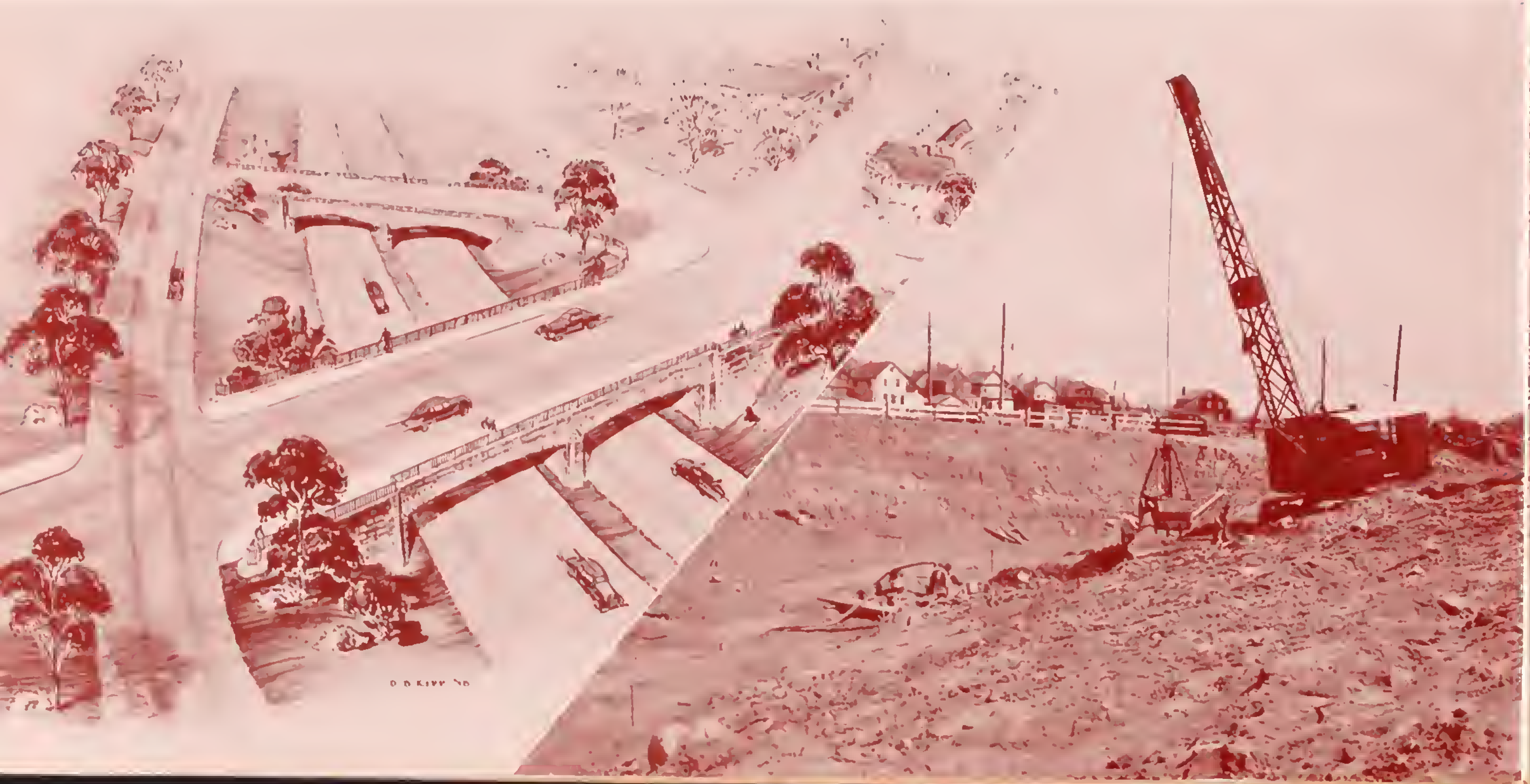
Near the present terminus of the parkway at Owl's Head Park, provision has been made to retain the 69th Street ferry to Staten Island. In this way, Staten Island and its future parkway system will be linked to the Long Island parkways.

The value of the Belt Parkway as a part of the great system linked together by the Bronx-Whitestone Bridge is evident even to a casual observer. Heretofore, while the distances were not great for modern motor cars, the problem of threading the interminable maze of city streets in the central part of Brooklyn and Queens, and the innumerable long and tiring traffic delays made communication between Long Island and upstate New York and Connecticut difficult and unattractive except to the hardy traveller.

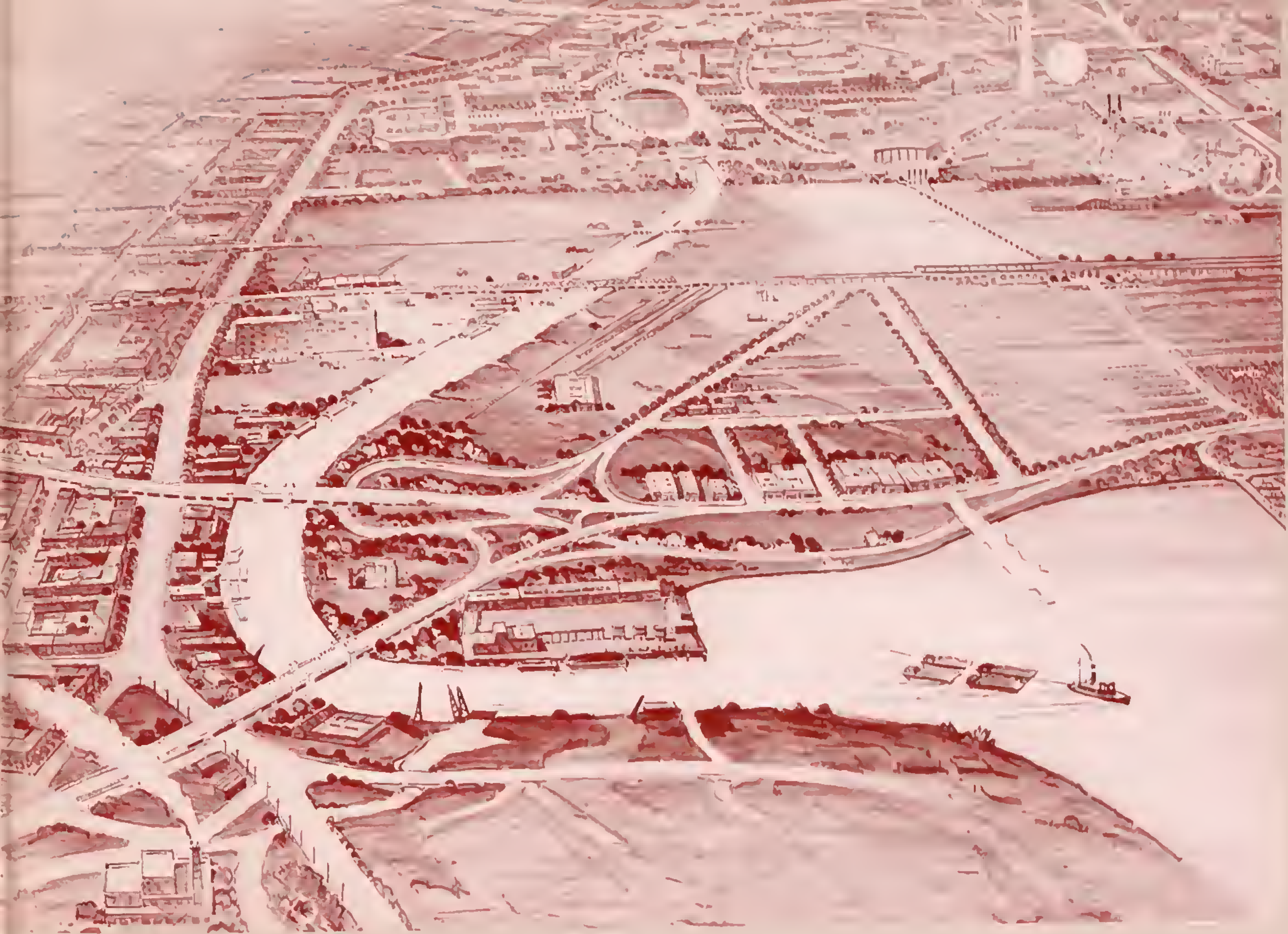
The new system will permit the residents of the five boroughs to travel a short distance from their homes on existing city streets, reach this Belt System and proceed with comfort to their destination. Or they may ride leisurely around four of the five boroughs of the City of New York, using the Belt System, including, in addition to those already mentioned, the Henry Hudson Parkway, the West Side Elevated Highway and, if the present plans are approved, the Brooklyn-Battery Bridge and its proposed connections which will tie the Brooklyn parkway system, now terminating at Owl's Head Park, with the Elevated Highway in Manhattan at Duane Street.

With the advent of the bridge, Jones Beach can easily be reached from the Bronx over restricted parkways without grade intersections or traffic lights, safely and enjoyably. It will be possible to leave Brooklyn and, without the necessity of encountering the heavy traffic in Manhattan, travel northward through a landscaped park and reach the upper limits of Westchester County quickly and conveniently.

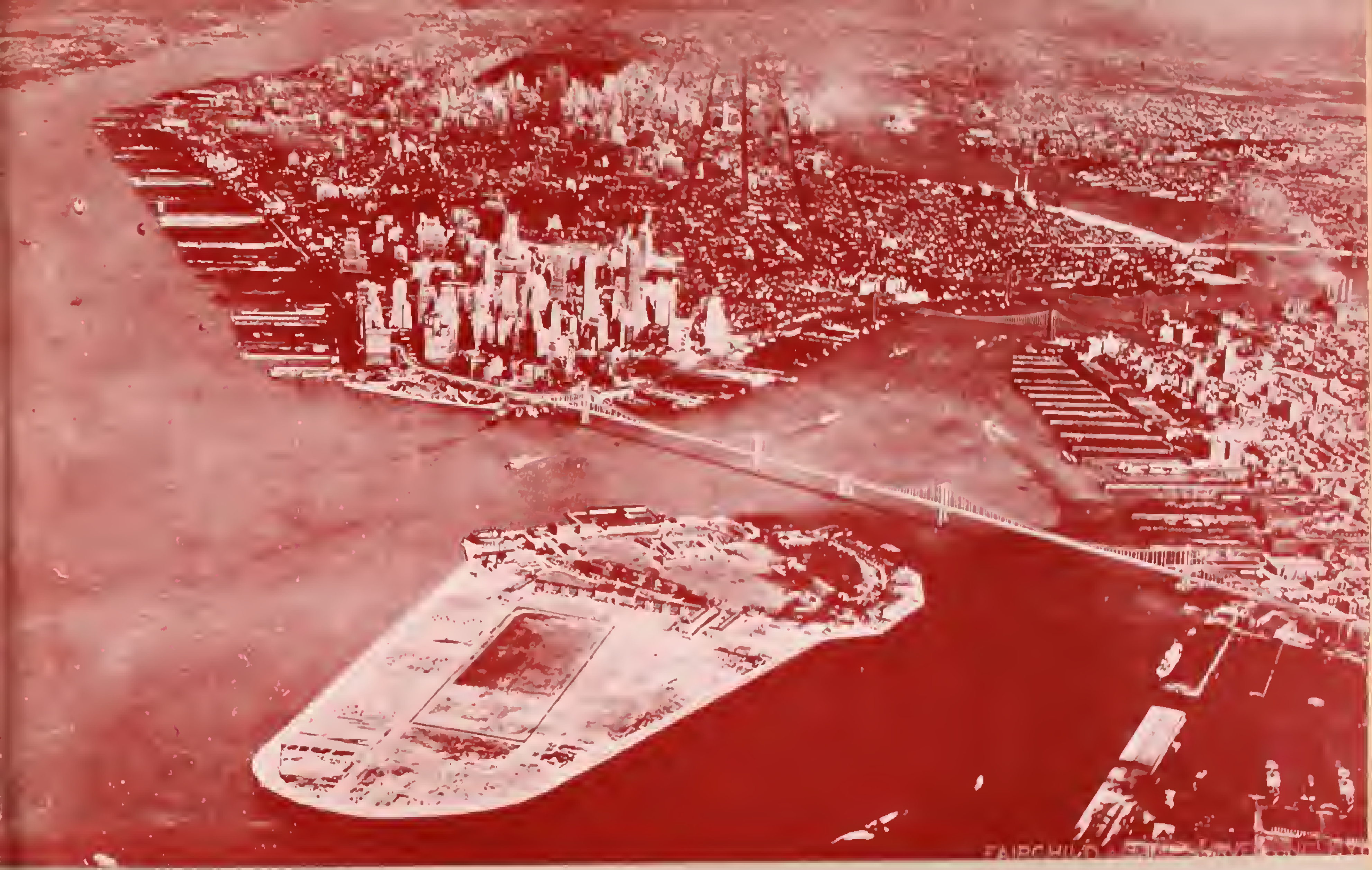
The Belt Parkway is the most recent contribution of the city in its attempt to solve its greatest problem, the maintenance of free-flowing traffic.



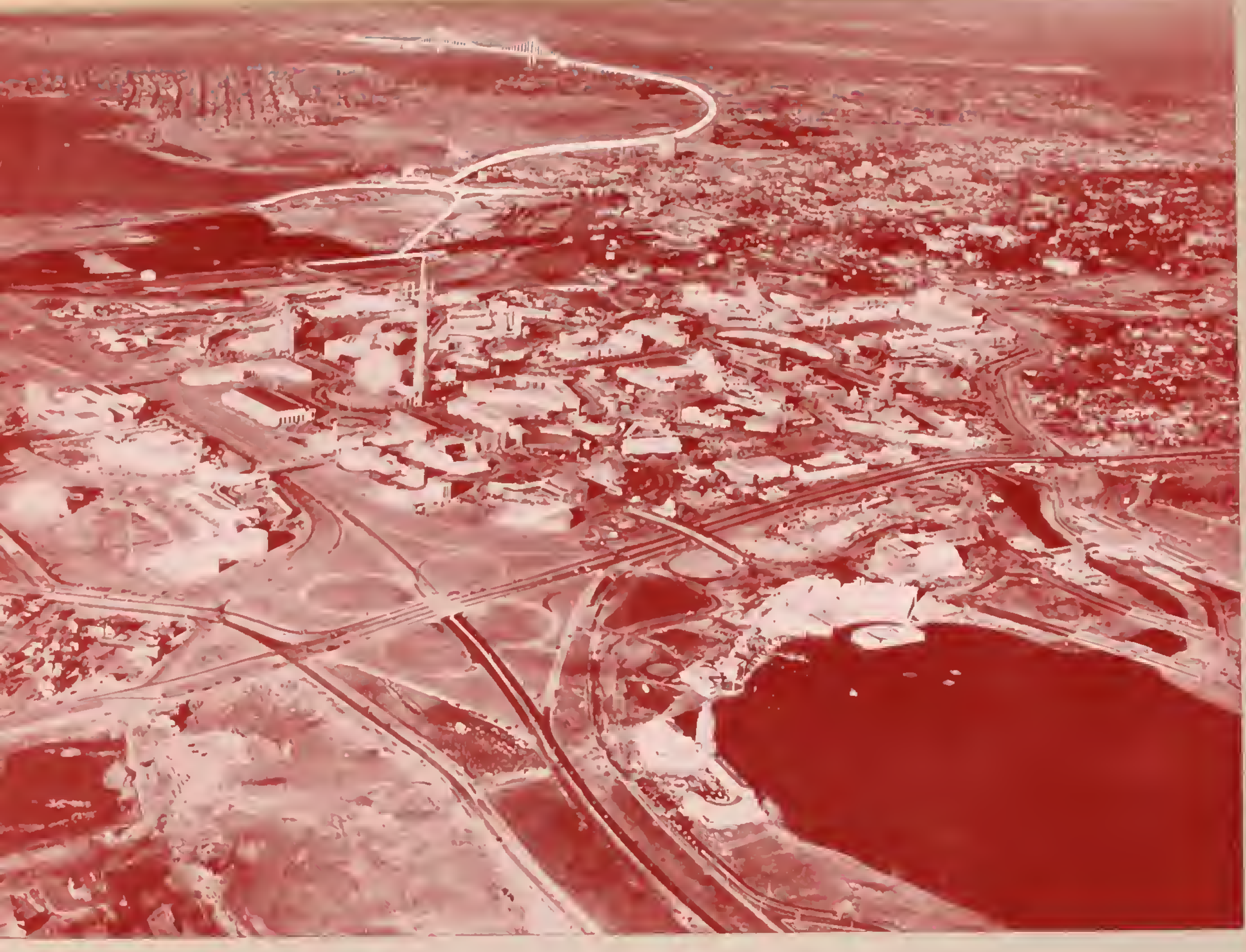
PERSPECTIVE OF GRADE ELIMINATION • BELT PARKWAY CONNECTION • 14th AVENUE AND 149th STREET, WHITESTONE • WORK IN PROGRESS • APRIL 10, 1939



BASCULE BRIDGE (LOWER LEFT) PROVIDES CONNECTION OVER FLUSHING RIVER TO GRAND CENTRAL PARKWAY AND THE NEW YORK WORLD'S FAIR



PROPOSED BROOKLYN-BATTERY BRIDGE



EASIEST WAY TO FAIR FROM THE NORTH AND EAST

VIA BRONX-WHITESTONE BRIDGE TO

CITY PARKWAY FIELD · NORTHERN BOULEVARD

FINANCING THE BRONX-WHITESTONE BRIDGE

WHERE THE MONEY CAME FROM:

The Authority sold $18,000,000 of Triborough Bridge Authority serial bonds to a syndicate of bankers on April 27, 1937, and thereafter placed to the credit of the Authority:

From proceeds of the sale	$17,692,000
From operation funds reserved for special purposes at the time of financing and found in excess of needs	53,000
Contribution from property owners in reimbursement for building of overpass in the Bronx	25,000
Interest earned on time deposits	15,000
	$17,785,000

HOW THIS MONEY WAS SPENT:

Construction including overhead, engineering and contingency reserve	$15,219,000
Real Estate	1,070,000
Interest to April 29, 1939	1,496,000
	$17,785,000

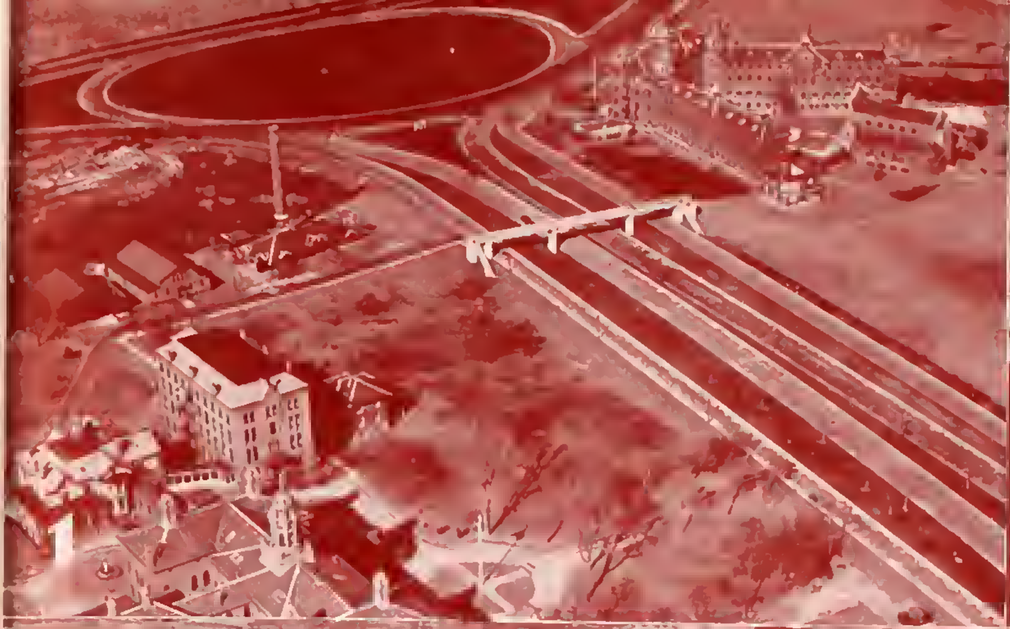
HOW THE $18,000,000 OF SERIAL BONDS WILL BE REPAID:

This debt will be amortized over thirty-one years by payments starting on April 1, 1942, at	$ 250,000
And rising to a maximum on April 1, 1968, of	900,000
Interest at 4 per cent, to be paid semi-annually on the unamortized balance will amount in the first year to	720,000
And in the last to	36,000

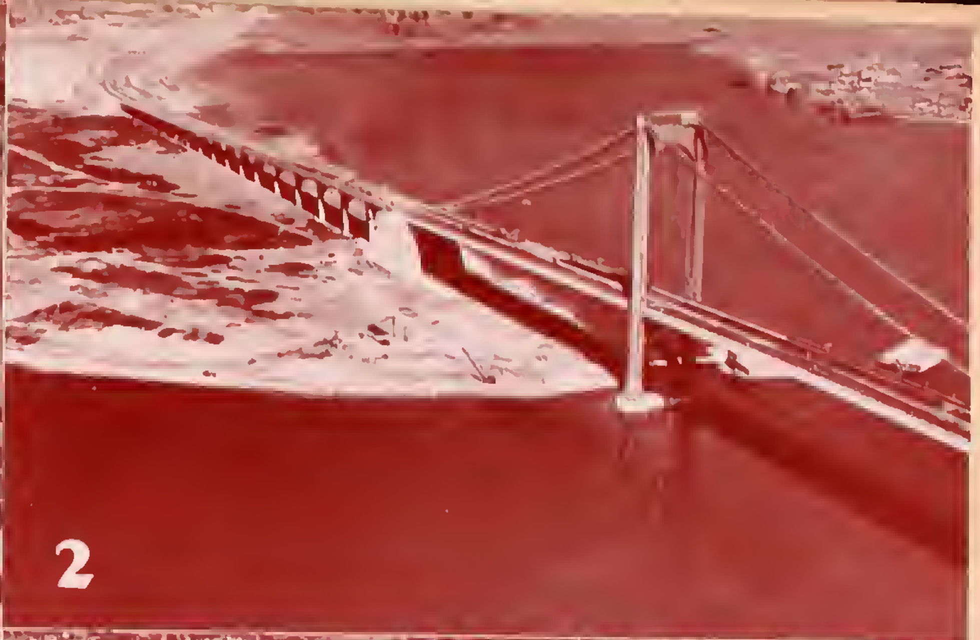
TOLL RATES
BRONX-WHITESTONE BRIDGE

CLASSIFICATION NUMBER		
1.	Passenger automobiles, all types taxicabs, ambulances, hearses and horse drawn vehicles	25c
2.	2 axle—Trucks, load capacity 2 tons and under	25c
3.	Trucks, load capacity over 2 tons to and including 5 tons	35c
4.	Trucks, load capacity over 5 tons	50c
5.	Buses	50c
6.	3 axle—Trucks, tractors or passenger automobiles with semi-trailer	60c
7.	4 axle—Trucks, tractors or passenger automobiles with trailer	75c
8.	Motorcycles	15c
9.	Bicycles	10c

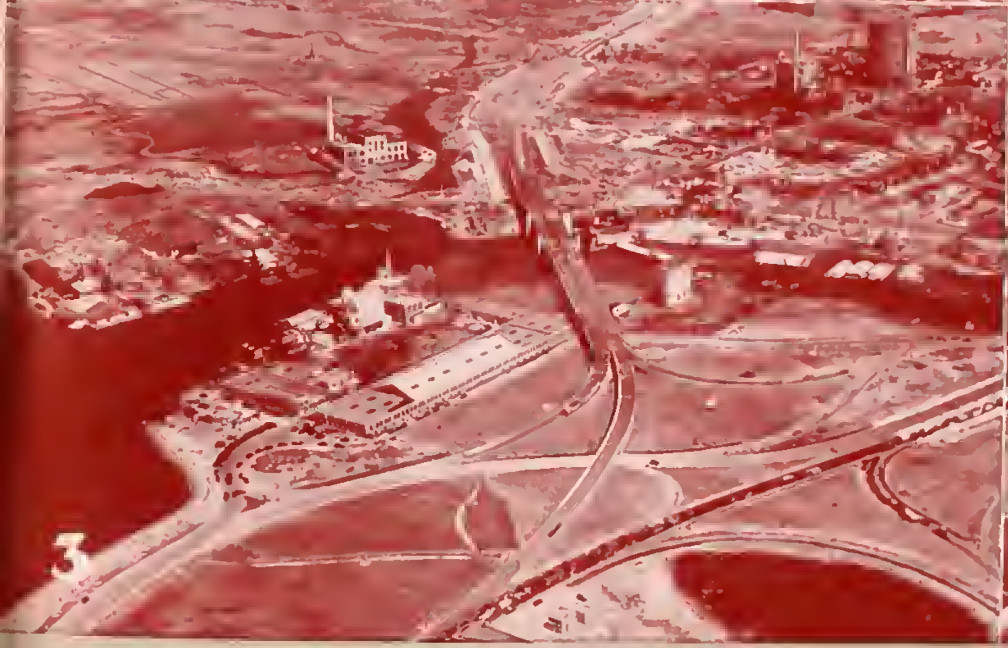
NO COMMUTATION RATES



1 Bronx approach to Bronx-Whitestone Bridge—
Showing Traffic Circle Eastern Boulevard



2 Bronx anchorage



3 Queens approach to Bronx-Whitestone Bridge
at Northern Boulevard

4 Construction in progress on Belt Parkway connection

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